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SANITARY COMMISSION.

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REPORT

OF A

COMMITTEE OF THE ASSOCIATE MEDICAL MEMBERS

OF THE

SANITARY COMMISSION

ON THE SUBJECT OF

EXCISION OF JOINTS

FOR

TRAUMATIC CAUSE.



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THE attention of the Sanitary Commission has been directed to the fact, that most of our Army Surgeons, now in the field, are unavoidably deprived of many facilities they have heretofore enjoyed for the consultation of standard medical authorities. It is obviously impossible to place within their reach anything that can be termed a medical library. The only remedy seems to be the preparation and distribution among the medical staff of a series of brief essays or hand-books, embodying, in a condensed form, the conclusions of the highest medical authorities in regard to those medical and surgical questions which are likely to present themselves to surgeons in the field, on the largest scale, and which are, therefore, of chief practical importance.

The Commission has assigned the duty of preparing papers on several subjects of this nature to certain of its associate members, in our principal cities, belonging to the medical profession, whose names are the best evidence of their fitness for their duty.

The following paper on "Excision of Joints for Traumatic Cause" belongs to this series, and is respectfully recommended by the Commission to the medical officers of our army now in the field.

FRED. LAW OLMSTED, *Secretary.*

WASHINGTON, December 6, 1861.

THE EXCISION OF JOINTS

FOR TRAUMATIC CAUSE.

ALTHOUGH excisions have been practised upon all the articulations of both extremities, for traumatic lesions which would otherwise demand amputation, satisfactory experience of their results, except in the shoulder and elbow, is, at present, either wanting, or of a very limited character. To appreciate their exact value for each individual joint is, consequently, hardly practicable. More than this, the peculiarities of these operations, and the conditions which justify their adoption, are such, that, in the varying fortunes of a campaign, the character of the injuries inflicted, the state of surgical resources, or other circumstances, may even require them to be abandoned altogether. The propriety of their performance, also, obviously varies with the limb implicated. An excision in the lower extremity, which is designed to support the weight of the body and is the chief agent in locomotion, is evidently a different thing from one in the upper extremity, which, with gentler movements to execute, has no weight to sustain, acts independently of its fellow, permits exercise and locomotion during the processes of cure, and which may be shortened, deprived of certain uses, and limited in others, yet still remain of the greatest service. The contrast is made still more apparent when we remember the admirable substitutes for the lower extremity which mechanical ingenuity has furnished, whilst the most imperfect and partial movements of the hand surpass in usefulness those of the best artificial contrivances which have yet been invented.

The wounds made by round bullets, (rarely those by Minié balls,) by fragments of shell, and occasionally those from sabre-cuts, or from the smaller projectiles thrown by cannon, are almost the only injuries in which excisions can be attempted. Compound dislocations, sometimes happening from accidents in mounted drill, or possibly during an engagement, are thought by many authorities to demand removal of the projecting articulating surface, rather than simple reduction. The precise traumatic conditions to which these operations are adapted are not, however, easily determined. Gun-shot injuries of joints, especially in the lower extremity, are apt, either unquestionably to demand amputation, or else to hold out some hope from expectant treatment; the choice left is not the easy one between excision and amputation, but the difficult and perplexing one between excision and an attempt to save a limb without an operation. A knee-joint completely shattered, with extensively lacerated soft parts, excites no doubt in the surgeon's mind as to what course he shall pursue. The single small bullet-wound, in the vicinity of an articulation, with no crepitus, a doubtful synovial discharge, and no local or constitutional symptoms, is a condition which cannot but embarrass the most experienced in deciding upon so grave an operation as that of excision. Yet this is precisely the character of injuries in which the question of conservative operations is to be decided. A ball imbedded in or near an articulation may at first give rise to little disturbance, but if left to itself will sooner or later excite the well-known signs of joint-injury, with long and wasting suppuration, deep and painful abscesses, and their concomitant dangers; and when these symptoms have manifested themselves, excision, or indeed any other operation, offers but little prospect of success.

It is clear, then, that the circumstances, if not the cases, which permit of excision, must be of comparatively rare occurrence. The tendency of modern practice has led us to hope much from conservative surgery, and the success of excisions for disease and for traumatic causes in civil hospitals has encouraged the expectation of results equally brilliant

from the same practice after gun-shot wounds received in battle. But the fact cannot be concealed, that excisions, hardly excepting even those of the head of the humerus and of the elbow, are operations not likely to succeed in the hospitals of an army under any circumstances. The unfavorable hygienic conditions which must prevail amongst large numbers of wounded men congregated together, will often decide the fate of the soldier whose limb a mistaken kindness may have tempted his surgeon into the endeavor to preserve. To incline towards the side of conservatism in cases permitting of doubt, will be to see patients die whose lives amputation might have saved. It was for these reasons that the practice of conservative surgery was so very limited in the recent Italian campaign, and in the lower extremity almost abandoned. They cannot but weigh with equal force in that in which the United States Army is now engaged.

So much being premised, the most important points connected with the various excisions will now be passed rapidly in review.

HEAD OF THE HUMERUS.

The advanced position of the soldier's shoulder when in the act of firing makes it an event of not infrequent occurrence for a bullet either to bury itself in the head of the humerus, or to traverse it without much comminution, or, striking immediately below it, to break the bone short off at its neck. Heavier projectiles also and fragments of shell sometimes lay open and fracture the joint, and carry away, perhaps, a portion of the deltoid muscle. In these or other injuries of the shoulder-joint, unaccompanied by damage to the large vessels and nerves, and when the bone is not too much splintered or comminuted in the shaft, the judgment of the surgeon must determine the propriety of an attempt to save the limb. Extensive fissures do not absolutely interdict excision, and whilst decapitation of the humerus is ordinarily alone required, four

and even five inches of the bone have been removed without detriment to the result. Sometimes, on the other hand, only a portion of the articulating surface of the humerus seems to need removal; but the subsequent mobility of the arm will be less restricted if the whole head of the bone is taken away. Unfortunate results do not, however, as a rule, follow partial excision in this, as in other joints.

As gun-shot wounds are of so variable a character, injuries to the coracoid and acromion processes, to the clavicle, and more rarely to the body and neck of the scapula, will occasionally be found complicating that of the humerus. Although extensive fracture of the scapula destroys the probability of success, fragments of it have been removed, and recovery has ensued, notwithstanding the profuse suppuration and protracted treatment following.

A patient with a shattered head of the humerus may recover without an operation, but, to say nothing of greater safety, more rapid and better results follow excision than the gradual exfoliation of fragments. The time required, and the condition left by the slow processes which accompany the latter course, are more unlikely to give a useful arm. As the operation can be performed with the same, if not more success, after the establishment of suppuration, a certain amount of delay is admissible in doubtful cases. Statistics show that secondary excisions of this joint are more successful than primary, in the proportion of 17 to 10. This is explained by the fact, that it is the less grave cases which are reserved for expectant treatment, and because, by the lapse of time, and after the establishment of suppuration, the exact extent of the injury can be determined in a manner not always easy at the time of its occurrence. In the one case all is excised which should be; in the other, the removal may fall short of its proper limits.

OPERATION. — Formal incisions will often be modified by wounds of the soft parts. When this is not the case, a straight incision, commencing as high as the acromion and just external to the coracoid process, the point of the knife penetrating

to and keeping in contact with the bone, is prolonged downward along the anterior aspect of the joint. This corresponds with the bicipital groove containing the long head of the biceps muscle, which, released from its sheath, is to be held to one side and preserved undivided. The tendons of the scapular muscles, which in a great measure form the capsular ligament, are then put on the stretch by rotating the arm inwards or outwards, according to the side on which they are to be attacked, and divided with sufficient freedom to allow the head of the bone to be tilted from its socket. The posterior circumflex artery, a vessel of large size, and the circumflex nerve, both of which pass close to, and just below, the head of the humerus, must be respected, if possible. Another method of performing this excision consists in making a crescent-shaped incision posteriorly, commencing beneath the acromion and proceeding backward and downward. As the patient lies on his back, it permits the secretions to escape with great facility, and the burrowing of matter is thereby prevented. The preservation of the long tendon of the biceps is more difficult in this method than in the preceding. The section of the bone is accomplished with the saw, the soft parts being protected by a spatula or card passed behind it. In cases of fracture of the neck, and when the head cannot be turned out of its place, it must be seized by strong forceps (tooth-forceps, for instance), and removed in the manner which circumstances will permit. In such instances it is only necessary to cut off the sharp edges and irregularities of the shaft of the bone.

AFTER-TREATMENT. — The tendency of the latissimus dorsi and teres major to draw the extremity of the humerus inward, is to be prevented by a pad or cushion in the axilla. Besides this, repose, with the shoulder and arm supported on a pillow, cold-water dressing for the first few days, and subsequently gentle compression by bandages, to prevent the burrowing of pus down the arm, with a sling and the confinement of the humerus to the side of the body, constitute all the treatment which can be required until passive motion is to be at-

tempted. This is generally admissible by the second or third week, and is to be practised daily, unless contra-indicated by the symptoms or the extreme pain produced. The surgeon may console himself for the slow progress of his case by remembering that the chances of ankylosis are said to be in proportion to the rapidity of cure.

ELBOW-JOINT.

The exposed position of the elbow, both in loading and firing, makes it, like the shoulder, constantly the recipient of gun-shot injuries; and the choice between amputation and excision is far more difficult than in the last-named articulation, which from its anatomical position can, even under adverse circumstances, be kept tolerably immovable, and consequently free from many sources of after trouble with much greater ease than the elbow. Either for this or some other reason, not apparent, gun-shot wounds of the joint of the elbow less frequently do well without operation than those of the shoulder. When left to nature, the track of a ball which passes near the joint, as well as the joint itself, usually becomes carious, and ultimately demands excision. "I have seen," says Macleod, "several cases in which, after being traversed by a ball, attempts have been made to save the elbow without excising it; but such trials were anything but encouraging. The motion of the joint and its consequent use will be found much greater after excision than when the arm has been saved without operation."

It would perhaps seem that nothing could be more easy than to diagnosticate the injury which the bones of a joint like the elbow may have received. Such is not the case, however. The whole upper end of the ulna may be crushed and fractured into the joint, yet leave no deformity, and allow the patient to perform all the usual movements. This is owing to one of the peculiarities of gun-shot fractures, viz. the preservation of the periosteum unlacerated, whereby the fragments are bound together, and the form of the bone is retained. It fol-

lows, therefore, that in an examination of a gun-shot fracture, either in this or any other joint, very little assistance can be derived from the common probe. The only reliable probe is the surgeon's forefinger, and to admit this the wound of the soft parts may at any time be enlarged.

In extensive injuries, the state of the soft parts, the condition of the large blood-vessels, and the probable extent of fissures, must decide the question of operation. "As regards the results, it is of no consequence whether the excision is performed in the first forty-eight hours, or after the full development of suppuration." (Stromeyer.) In no joint are the propriety and advantages of excision so conclusively established as in this.

OPERATION. — The elbow is excised by a straight incision along the inner border of the olecranon, extending three inches above and three below that process. If the operation is performed after the parts have become stiffened by inflammation or serous infiltration, a second short incision at right angles to the first may be carried outwards over the end of the olecranon towards the external condyle. The entire thickness of soft parts should be raised on either side from the surface of the bone, special care being taken that the ulnar nerve, where it lies in the groove at the inner side of the olecranon, is not interfered with. This can only be insured by keeping the knife constantly in contact with the bone. The soft parts in which it reposes, or the nerve itself, if it is released from its sheath and exposed, should be held to one side; division of the lateral ligaments and conjoined tendons will then freely open the interior of the joint. The advantage of the straight incision is, that the connection of the triceps tendon by its edges with the investing aponeurosis of the arm and forearm remaining intact, an attachment for the muscle is thus effected which diminishes to a certain extent the loss of power following the unavoidable division of the tendon at its insertion into the olecranon. It is true that a transverse incision facilitates the operation, but it is far better to secure this temporary con-

venience by extending the longitudinal incision, than to sacrifice the important permanent advantage which the single incision promises to secure.

The extent of the excision must be such that, when the parts are brought together, the bones neither lock nor refuse easy flexion. The insertions of the biceps and brachialis anticus muscles are to be preserved whenever possible, and it is to be remembered that, in dividing the ulna and radius low down, the interosseous artery will be endangered. Four inches of bone above and four below the joint have several times been removed, a useful arm being regained. In operations, however, which open the medullary cavity of the shaft, the dangers of myelitis are to be dreaded. Partial excision, on the other hand, even if the end of one or more of the bones appears uninjured, is not admissible, as such cases are more liable to fail, and are less satisfactory in the resulting mobility when they succeed, than if the whole articulation is removed. In many instances, the detachment of fragments, and smoothing off the sharp processes of the fractured bones with bone-forceps, will constitute the whole operation of excision.

AFTER-TREATMENT. — For the first week, and until suppuration has become established, the arm should repose on a pillow bent at an obtuse angle of about one hundred and thirty-five degrees, (that being one of greater ease than a right angle,) with cold-water dressing to the wound. Subsequently poultices may be substituted; but in all excisions it is to be remembered that the long-continued use of poultices retards adhesive processes and encourages suppuration and ulceration. It will not be before the expiration of the second or third week that a rectangular splint can be applied, and this, if possible, should be one which permits of a variation from day to day of the position in which the arm is to remain flexed. Passive motion is to be commenced at the earliest moment the wound and the patient's endurance will permit, and be faithfully kept up by the surgeon as frequently as it can possibly be practised.

WRIST-JOINT.

Under the title of this excision are to be included all operations which excise a part or the whole of the ends of the radius and ulna, a part or the whole of the carpus, the proximal ends of the metacarpal bones, or even all of these together. It will at once be seen that in this operation the first law of excisions can rarely be fulfilled; viz. that, together with the partial or complete removal of the articular extremities of the bones, there shall be a free exposure or destruction of the synovial cavity of the joint.

Of all the principal excisions performed for disease, that of this joint is the one on which least reliance is placed. In default of experience, therefore, the inference is that in military surgery it will furnish still less favorable results. The "wrist" was excised three times during the Crimean war, with one fatal result, and the end of the radius has been quite a number of times successfully removed in cases of compound dislocation. There is consequently precedent sufficient, perhaps, to authorize renewed trials in cases not accompanied by too great laceration of the soft parts.

OPERATION. — The removal of any part of the wrist-joint, for gun-shot injury, can hardly be accomplished without division of the extensor tendons; indeed, the lesion prompting interference will probably have already effected this. The fractured bones must be patiently dissected out, and the detachment of fragments will in most cases constitute the whole operation. The end of the radius may, perhaps, admit of removal with the saw.

AFTER-TREATMENT. — This is to be conducted upon general principles; but after the first few days, the fingers and the thumb should be kept semi-flexed by resting upon some rounded body, (a roller bandage, for instance,) so that, if any motion is retained, their approximation may be more

readily accomplished. Passive motion of the fingers cannot be attempted for considerable time after the operation, but should be begun as soon as possible. The restoration of but slight mobility is, however, to be expected.

HEAD OF THE FEMUR.

Even when the upper part of the femur has been shot through, rotation outwards and crepitus are not always present, and sometimes very considerable power of flexion and extension remains. The degree of injury and the condition of the parts after a bullet-wound of the hip-joint are indicated by still more inconclusive symptoms, and are as difficult to determine as the cases are certain to terminate fatally. "Picture to yourself," says Mr. Guthrie, "a man lying with a small hole, either before or behind, in the thigh, — with no bleeding, no pain, nothing but an inability to move the limb, or to stand upon it, — and think that he must inevitably die in a few weeks, worn out by the continued pain and suffering attendant on the repeated formation of matter burrowing in every direction, unless his thigh be amputated at the hip-joint, or he be relieved by the operation of excision, which, I insist upon it, ought first to be performed."

The cases permitting this operation are of infrequent occurrence, and are confined almost exclusively to bullet or shell wounds, involving the neck of the femur, or the trochanters, or which fracture the shaft in their vicinity.

But ten instances in which the head of the femur has been removed for traumatic cause have ever been published. Seven of these were performed in the Crimea, and of the entire number but one recovered.

The chances of recovery after disarticulation in military practice may be inferred from the statement that the operation was performed by the English fourteen times, and by the French thirteen times, in the Crimea, without a single recovery, and in the Schleswig-Holstein campaign seven times, with but one successful result.

Which of these alternatives, then, is to be adopted? By following an expectant course, and trusting to the resources of nature, an almost invariable mortality will ensue. It is equally rare for disarticulation to succeed, or for patients to survive more than a day or two after its performance. The remaining resource, excision, possesses at least the advantage of not putting life in immediate danger, one of the patients in the ten cases alluded to having survived five weeks, others from six to seventeen days, and only one so short a time as twenty-two hours; whilst, if the present percentage of recovery is maintained in a larger number of cases, it will prove a very much less fatal operation than disarticulation.

Excision of the head of the femur, therefore, merits further attention from the military surgeon, and offers an additional chance of saving life in an otherwise almost hopeless class of cases. This is the only aspect in which the question is to be regarded; the usefulness of the limb left is a consideration not necessary to be entertained.

Contrary to the course admissible in the upper extremity, in the hip, excision should be primary and immediate; suppuration and exhaustion, or more rapidly acting causes, being sure to lead to a fatal result if anything like an expectant plan of treatment is adopted and the operation is deferred. And it may be said here, with regard to all excisions, that if the patient is in a state of shock, the administration of ether, (of the inhalation of which, under these circumstances, there need be no fear,) will often bring up the pulse and excite reaction to an extent authorizing an operation. The shock following excision, and due to it alone, is necessarily less than that of an amputation, since the blood contained in the limb is not lost. Death from this cause has, however, followed excision of the larger articulations, and the surgeon should be forewarned of the possibility of its occurrence.

OPERATION. — A curved incision just above the prominence of the great trochanter, with its convexity directed downward

in the long axis of the limb, or a straight incision in a line with the shaft of the femur, five or six inches in length, the centre of which shall correspond to the trochanter, exposes the upper part of the femur in a manner well suited for its removal, and without endangering any important vessels. Whenever the head still maintains its connection with the rest of the bone, the precaution should be taken to dislocate it from the acetabulum before detaching it from the shaft. The comminuted fragments are to be dissected out, or the upper portion of the bone protruded and sawed off. The great trochanter, whether injured or not, should always be removed, otherwise it will project into the wound, prevent healing, and act as an obstruction to the discharge of pus or exfoliating fragments of bone. In the single successful case of excision for traumatic cause, five inches of bone were removed.

AFTER-TREATMENT. — Subsequent to the operation, little more is required than rest, and the maintenance of the limb in a proper position and right direction with the body. The tendency in the end of the femur to protrude at the wound is a point especially to be remembered. A bottle of water of variable weight, at the end of a cord attached to the leg by means of sticking-plaster, and then passing over a pulley at the foot of the bed, will partially secure these ends, but no regular extension with splints or apparatus is admissible; shortening or deformity are of little importance, if the patient's life is saved; and to secure this, his comfort and repose, free from bandages, or their frequent adjustment, are more important considerations than the precise position or condition of the limb. In the successful case already alluded to, the limb was placed in a sling of stout canvas, which hung from a beam over the man's cot, and the plane of which formed an angle of twenty degrees with the horizon. This method of treatment was adopted in order to approximate the upper end of the bone to the pelvis, as well as to prevent the lodgement of matter

amongst the tissues, and to favor its escape. At the end of three months the patient was able to leave his bed, upon crutches. The sling adopted in this case has since been imitated in many instances of the operation for disease, and has been much liked by those who have used it.

KNEE-JOINT.

The gravest symptoms follow the penetration of the knee-joint by a gun-shot missile. Macleod says: "I have never met with one instance of recovery in which the joint was distinctly opened and the bone forming it much injured, unless the limb was removed. I have conversed with many persons, of large experience, on the subject, but never heard of any case recovering in which the diagnosis of fracture of the epiphysis was without a doubt." Esmarch declares that "all gun-shot injuries of the knee-joint in which the epiphysis of the femur or tibia has been affected demand immediate amputation of the thigh." Fractures of the patella, in which the joint is not otherwise implicated, are, however, an exception to this general rule, and authorize attempts at the preservation of the limb without operation.

Whether excision may be adopted with any propriety as a substitute for amputation in the class of injuries above referred to, statistics unfortunately do not enable us to decide.

Only six instances are known in which this joint has been excised for gun-shot injury. One, — complete excision and a secondary operation, — performed in the Crimea, proved fatal after twenty-eight days, from exhaustion and diarrhoea. A second occurred in the Indian campaign of 1857–58, when a native soldier underwent amputation of the left thigh and excision of the right knee, and died the next evening, with symptoms of shock. The third case, one of partial excision, the end of the femur alone being removed, was performed three days after the injury, during the Schleswig-Holstein campaign, and terminated fatally a month after the operation,

from tubercular disease and pyæmia. A fourth case, of which no details are given, proved fatal from pyæmia within a few days of the operation. Of two other cases occurring in civil practice, the wounds being from shot-guns, one was fatal from tetanus, two days after the operation, and the other recovered at the expiration of three months. Of six other cases of excision for incised wounds, compound dislocation, separation of the epiphysis, etc., and occurring in civil practice, two only ended in recovery.

Such is the discouraging catalogue of attempts to save the limb by conservative means ; of twelve operations, only three proved successful.

Results derived from so small a number of operations do not authorize a comparison with those of amputations, the mortality following which, when performed at the lower third of the thigh for traumatic cause, in military practice, is 56.6 per cent. (Macleod.)

It is impossible within the present limits to discuss the conditions which demand excision. The judgment of the surgeon must decide the question in the presence of each individual case. It is only in slight wounds of the joint, that the operation is to be undertaken ; when the extent of injury to the bone is such that considerable portions of it must be removed, excision is not the appropriate operation. If decided upon, it should always be done immediately after the accident ; for if suppuration and inflammation once establish themselves, the chances of success for either excision or amputation become very small indeed.

OPERATION. — The simplest and best method of excising the knee-joint is by a circular incision, extending half-way round the limb, on a line with the articulating surface of the tibia. It freely exposes the joint, and the dependent situation of its two ends favors the discharge of matter. It also permits the division of the hamstring tendons without any additional puncture or incision, and this is a step always desirable to take

in order to prevent the displacement of the leg, which so often happens during the first part of the treatment from the contraction of the muscles of the back of the thigh, especially of the biceps muscle inserted into the head of the fibula. The joint being opened, division of the crucial ligament permits the head of one bone, by flexing the limb, to be lifted up and opposed to the other in such a way that its section may be accomplished by the saw without endangering the vessels of the popliteal region. A thin segment of the articular surface of the bone remaining uninjured, (such being the case,) is also to be removed, and on no account is the patella to be left. Its usefulness is forever destroyed by the operation, and its presence is liable to excite disease in the bones, and protract the treatment. The limit to which the excision may be carried is a narrow one, for, to say nothing of extreme shortening, if it exceed the expanded enlargements of the extremities of the bone, there will be a too small basis of support at the point of anchylosis to insure safety and usefulness in the limb preserved.

AFTER-TREATMENT. — Absolute immobility during the after-treatment is all important. Perhaps no means of attaining this end can be more effectual, than the use of silver or iron wire sutures applied at the time of operation by means of a drill carried obliquely through the edges of both bones on each side of the limb; the ends being twisted, the bones are brought into firm and close contact. At the end of six weeks the wire may be cut and drawn out by main force. It is not known that this method of securing immobility has been attempted in traumatic cases, but its success in operations for disease suggests the propriety of its trial. The policy, however, which must govern the surgeon in the management of these cases should be one of extreme caution, free from meddlesomeness, and directed to saving the life of his patient rather than the usefulness of the limb. The application of a well-padded posterior splint is in no case to be omitted; and in a camp hospital

after the first few weeks, when swelling has subsided, and the immediate danger to life appears less imminent, the proper position and repose of the limb may sometimes be efficiently secured by a starch bandage, in which an aperture is left corresponding with the wound. An apparatus of some kind, which perhaps will often have to be extemporized by the surgeon, is however absolutely necessary until sufficient consolidation has taken place to admit of handling the limb without risk of disturbing the bones. During the second dressing, displacement of the tibia backwards is liable to occur unnoticed by the surgeon, who may discover it only when it is too late to be remedied; a considerable length of time must therefore be allowed to elapse before this is performed, and the first dressing should be made with reference to such a course. Some of the external applications may be changed, and the remaining dressing kept from becoming offensive by the free use of a solution of chloride of soda. The limb should not be lifted from the bed for as long a period as possible. The swelling of the whole limb, which frequently accompanies the slow process of recovery, may be restrained, if not prevented, by careful and smooth bandaging from the foot upward.

ANKLE-JOINT.

The ends of the tibia and fibula have been removed only on one or two occasions for gun-shot injuries, and then without success. The operation in these cases consisted rather in a removal of comminuted fragments of bone, than in a regular excision. Indeed, it is not easy to foresee circumstances likely to occur in the field, in which complete excision of the ankle-joint would be advisable. The recoveries which have followed the operation in cases of compound dislocation in civil practice indicate its propriety in accidents of that sort happening to soldiers, and which in the artillery and mounted service cannot be of infrequent occurrence.

The astragalus, in cases of its irreducible and compound

dislocation, may be removed, when manipulation and the division of bands which seem to prevent will not allow of its reduction.

In cases where the ends of the tibia and fibula, or the entire astragalus, are removed, and the joint destroyed, even if life is saved, a useful limb cannot be promised with any degree of assurance. Anchylosis and considerable shortening are the best results to be hoped for.

In removing any of the parts about the ankle-joint the posterior tibial artery will necessarily be divided. The preservation of the anterior tibial is therefore of great importance.

The application of adhesive straps in such a way as to keep the osseous surfaces approximated, and yet allow a free exit to all discharge, a carved side-splint, such as is sometimes used for fracture of the leg, and the resting of the limb on a pillow, are the chief features of the subsequent local treatment.

TARSUS.

The os calcis and part of the astragalus, and the os calcis alone, were successfully removed in the Crimea, the former once, and the latter four times. The os calcis, in cases of its comminution without implication of any other bones, must frequently permit of excision when amputation would otherwise be necessary. With this exception, gun-shot wounds of the tarsus, though they sometimes authorize attempts at *pre-servative* surgery, rarely justify conservative steps.

SMALL JOINTS OF THE HAND AND FOOT.

Injuries of the metacarpo- or metatarso-phalangeal and phalangeal joints of the fingers and toes seldom leave a choice between excision and amputation, except in cases of compound dislocation. This, in the toes, is infrequent, and hardly met with except at the metatarso-phalangeal joint of the great toe. Both here and in the thumb, excision is a more judicious treat-

ment than simple reduction, and averts the grave inflammation and suppuration which almost invariably follow the accident.

In excising the joints of the fingers, it must be borne in mind that the preservation of motion is most important in the metacarpo-phalangeal joints, or in those of the proximal phalanges; for if the proximal be stiff, no amount of motion in the distal joint can be of service; but if the proximal joint can be voluntarily flexed, a very small degree of mobility in the distal makes the finger a useful one. A stiff, straight finger is always in the way, and patients themselves will oftentimes ultimately solicit their amputation.

In the foot, the ankylosis and abbreviation, the scars and prominences which are left by excision, interfere with comfort when the shoe is worn, and although the foot requires a broad surface to sustain weight, and a certain length for easy walking, it can better bear the loss of a toe than pressure on an irregular and tender cicatrix.

Excisions of large joints are never to be practised on the battle-field, or under conditions which will require the immediate transportation of the wounded. It is only in stationary hospitals, or under circumstances where the sick can be left behind, that they are to be attempted. Exceptions to this rule may sometimes be made for excisions of the upper extremity; but even in these, unless considerable time has elapsed, removal can hardly fail to cause displacement of the parts, inflammation of the wound, and the consequent train of abscesses, constitutional disturbance, and, it may be, of graver accidents, — pyæmia, myelitis, necrosis, etc. Patients with excised joints are, however, always to be transferred, at the earliest suitable opportunity, from regimental to general hospitals, where they can remain undisturbed till recovery has taken place.

After an excision a successful issue depends upon constant personal superintendence on the part of the surgeon, and a continued call upon his patience and ingenuity is made by the requirements of necessary apparatus, or the varying modifications which it demands, and upon his judgment, either in maintaining absolute rest, if ankylosis is desired, or in regard to the time when passive motion shall be commenced, the frequency with which it shall be applied, and the indefatigable perseverance with which it shall be followed up when active local symptoms have subsided.

Useful and serviceable results, as a rule, are hardly attainable in less than a year from the time of excision. Soldiers may occasionally return to a modified duty in a less period than this after removal of the head of the humerus or of the elbow-joint, but a slow convalescence is alone to be expected. The subjects of these operations are therefore to be considered as permanently invalided. In view of long hospital confinement and protracted suppuration, it must be borne in mind, then, at the outset, that a patient may make a good recovery from a primary amputation when he will not survive a secondary amputation required by the failure of an ill-advised excision.

The preceding paper is recommended for publication to the United States Sanitary Commission, by the Medical Commission of the State of Massachusetts.

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